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U. S. NORTHERN BOUNDARY COMMISSION:

ARCHIBALD CAMPBELL, Esq., COMMISSIONER.

MAJ. W. J. TWINING, U. S. ENGRS., CHIEF ASTRONOMER.

NATURAL HISTORY.

No. I.

ON THE MURIDÆ.

BY

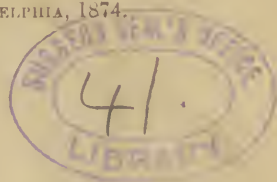
DR. ELLIOTT COUES, U. S. ARMY,

SURGEON AND NATURALIST OF THE COMMISSION.

REISSUED, WITH ADDITIONS,

FROM THE

PROCEEDINGS OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, 1874.



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COLLINS, PRINTER.

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I. ON THE MURIDÆ OF THE NORTHERN BOUNDARY SURVEY, WITH A CRITICAL REVISION OF THE NORTH AMERICAN GENERA AND SPECIES.

THE present is the first of a series of preliminary zoological reports which may appear from time to time, during the elaboration of the material secured by the Boundary Commission. General faunal considerations are deferred to the final report. The ground here covered is a belt of country along the parallel of 49° N., from the Red River of the North to the Rocky Mountains, representing the northern border of the Territories of Dakota and Montana. Of North American *Muridæ*, the genera *Sigmodon*, *Ochetodon*, *Myodes*, and *Cuniculus* are not represented, the first two being Southern, the others Arctic. All the genera and species are, however, introduced to complete an account of the group.

A. Subfamily MURINÆ.

(*Murine Series.*)

I. Genus **MUS**, L.

1. **Mus decumanus**, L.

Introduced.

2. **Mus musculus**, L.

Introduced.

(*Sigmodont Series.*)

II. Genus **NEOTOMA**, Say and Ord.

3. **Neotoma cinerea**, S. & O.

Eastern base and outliers of the Rocky Mountains; not eastward on the prairie. Frequent.

III. Genus **HESPEROMYS**, Woodh.

(Subgenus **VESPERIMUS**, Coues.)

4. **Hesperomys (Vesperimus) cucopus**, Lec.

Everywhere; the most abundant and characteristic species. Mainly represented by *var. sonoriensis*.

(Subgenus **ONYCHOMYS**, Baird.)

5. **Hesperomys (Onychomys) leucogaster**, Maxim.

Rare. One specimen secured at Pembina.

B. Subfamily **ARVICOLINÆ**.

IV. Genus **EVOTOMYS**, Coues.

6. **Evotomys rutilus**, var. **gapperi**, Coues.

Observed at various points. This is near its southern limit of distribution in these longitudes.

V. Genus **ARVICOLA**, Lacépède.

(Subgenus **MYXOMES**, Rafinesque.)

7. **Arvicola (Myxomes) riparius**, Ord.

Abundant, particularly about the prairie pools.

(Subgenus **PEDOMYS**, Baird.)

8. **Arvicola (Pedomys) austerus**, Lec.

Eastern portions of the Line. Probably represented westwardly by *var. curtatus*,* Cope.

VI. Genus **SYNAPTOMYS**, Baird.

9. **Synaptomys cooperi**, Bd.

Although not observed, the ascertained ranges of this remarkable and little known species brings it into the present connection. (Illinois, Kansas, Oregon, Alaska.)

VII. Genus **FIBER**, Cuvier.

10. **Fiber zibethicus**, Cuv.

On all the water-courses and permanent pools.

* The *Arvicola pauperrima*, Cooper, Am. Nat. ii., Dec. 1868, p. 535 (Washington Territory), not given in the following pages, is a synonym of *A. austerus*, var. *curtatus*, as I ascertain by examination of the type-specimen.

SYNOPSIS¹ OF THE MURIDÆ OF NORTH AMERICA.

Family MURIDÆ.

Taken in its current acceptation, but with exclusion of the genus *Jaculus*, which differs sufficiently in dentition, in the character of the anteorbital foramen, proportions of limbs, and other features.

$$\text{I. } \frac{1-1}{1-1}; \text{ C. } \frac{0-0}{0-0}; \text{ P. } \frac{0-0}{0-0}; \text{ M. } \frac{3-3}{3-3} = \frac{4-4}{4-4} = \frac{8}{8} = 16 \text{ teeth.}$$

Anteorbital foramen a large pyriform slit, bounded exteriorly by a broad plate of the maxillary.

Subfamily MURINÆ.

Molars rooted, tubercular, with crenate periphery. Root of under incisor causing protuberance on outside of jaw, at or near notch between condyle and coronoid process. Descending process of mandible a broad flattened plate, wholly below plane of the molars. Anterior root of zygoma deeply nicked at the anteorbital foramen. Palate nearly plane.

Murine Series.

Molars with three tubercles in transverse series. Soles naked. (Only indigenous in the Old World—introduced in the New.)

Genus I. **MUS**, Linn., emend.

1. **Mus decumanus.**
2. **Mus alexandrinus.**
3. **Mus rattus.**
4. **Mus musculus.**

¹ Abstract of a memoir in which the characters of the varieties, species, and higher groups are treated in full, with synonymy, bibliography, etc., and the argument for the views advanced. Based on the material (several thousand specimens) in the Museum of the Smithsonian Institution.

Sigmodont Series.

Molars with two tubercles in transverse series. Soles normally¹ hairy. (New World rats and mice.)

Genus II. **NEOTOMA**, Say and Ord.

SYN. *Mus*, sp., Say and Ord, 1818; Desm., 1822.—*Arvicola*, sp., Harlan, 1825.—*Lemmus*, sp., Fisch., 1829.—*Neotoma*, Say and Ord, J. A. N. S. P. iv. 1825, 346, and of authors; type, *N. floridana*.—*Myoxus*, sp., Rich., Zool. Journ. iii. 1828, 517 (*N. cinerea*).—*Teonoma!* J. E. Gray (same type).

Obs. Embracing sigmodont rats of North and Middle America, of the largest size, highly murine in general aspect. None so small as the largest of the other N. American species. There are abundant cranial and external generic characters. Only here we find in one species a bushy distichous tail, almost as in *Sciurus*—a circumstance which doubtless caused the reference of the species to *Myoxus*; but other species of the genus do not show this feature.

Analysis of Species.

I. Tail scantily hairy (nearly as in *Mus*).

- a.* Tail bicolor, barely or not as long as the body without the head. Feet entirely white. Length 9 inches or less; tail 6 or less.

FLORIDANA.

- b.* Tail unicolor, blackish, about as long as head and body. Feet partly dusky.

- a'.* Large; about the size and general coloration of *N. floridana*.

FUSCIPES.

- b'.* Small; length about 7 inches. Coloration rich, warm rusty-red, with snowy white underparts. (Extralimital.)

FERRUGINEA.

II. Tail densely hairy (as in *Myoxus*), bicolor. Size of the first, or larger.

CINEREA.

Obs. In addition to the foregoing, occurs *N. magister*, a fossil species, known only by its skull. It is a probable progenitor of series I., if not of the whole. *N. cinerea* obviously stands apart; the other species still continue more nearly united, though I have not seen exactly intermediate specimens.

¹ Naked in *Sigmodon*, in subgenus *Oryzomys*, and almost so in two species of subgenus *Vesperimus*.

1. *Neotoma magister*, Baird, M. N. A. 1857, 498, in text. Loc. of remains:—Caves in Pennsylvania, near Harrisburg and Carlisle.

2. *Neotoma floridana*, Say and Ord.

SYN. *Mus floridana*, Ord, Bull. Soc. Philom. Phila. 1818, 181.

Arvicola floridana, Harlan, Fn. Amer. 1825, 141.

Neotoma floridana, Say and Ord, J. A. N. S. P. iv. 1825, 352, pl. x. figs. 1, 2, 3, 4.

Lemmus floridanus, Fischer, Syn. 1829, 299.

Neotoma mexicana, Bd., P. A. N. S. P. vii. 1855, 333; M. N. A. 1857, 490; Mex. B. Surv. ii. 1859, 44, pl. 24, f. 1 *a-g*.

Neotoma micropus, Bd., P. A. N. S. P. vii. 1855, 333; M. N. A. 1857, 492; Mex. B. Surv. ii. 1859, 44.

Hab. Southern United States, and Northern Mexico. North to Maryland (*Audubon*), New York (*Bell*), and Massachusetts (*Gibbs*). Illinois, Arkansas, Kansas.

3. *Neotoma fuscipes*, Cooper.

SYN. *Neotoma fuscipes*, Cooper's MSS., Bd., M. N. A. 1857, 495.

Hab. California.

[3 *bis*. Extralimital: *Neotoma ferruginea*, Tomes.]

SYN. *Neotoma ferruginea*, Tomes, P. Z. S. 1861, 281.

Hab. Guatemala. Tehuantepec (*Sumichrast*).

4. *Neotoma cinerea*, (Ord) Baird.

SYN. *Mus cinereus*, Ord, Guthrie's Geog., 2d Am. ed., ii. 1815, 292 (based on ash-colored rat with hairy tail of the Rocky Mts., Lewis and Clarke, *passim*).

Neotoma cinerea, Bd., M. N. A. 1857, 499, pl. liii. f. 4.

Myoxus drummondii, Rich., Zool. Journ. iii. 1828, 517.

Neotoma drummondii, Rich., F. B. A. i. 1829, 137, pl. viii.

Neotoma occidentalis, Cooper's MSS., Bd., P. A. N. S. P. vii. 1855, 335; M. N. A. 1857, 496, pl. liii. f. 3.

Hab. Western and Northwestern North America, to the Pacific. East to Nebraska, Colorado, etc., and in British America to Hudson's Bay. South to New Mexico and California.

Genus III. SIGMODON, Say and Ord.

SYN. *Sigmodon*, Say and Ord, J. A. N. S. P. iv. 1825, 352. *Arvicola*, sp., Aud. and Bach., Harlan, Godman.—*Hesperomys* (subg. *Deilemys*), De Saussure, R. & M. Z. 1860 (type *toltecus*).

Obs. Very closely related to the average sigmodont micc. Larger than usual; pelage hispid; soles naked, granular; hind

feet very long. 1st and 5th toes subequal and very short; forefeet not half as long as the hind. Tail nearly naked. Dental and cranial characters slight. I can find but one species.

1. *Sigmodon hispidus*, Say and Ord.

SYN. *Sigmodon hispidum*, Say and Ord, J. A. N. S. P. iv. 1825, 354, pl. x. f. 5, 6, 7, 8; and of authors.

Arvicola hispidus, Godm., Am. Nat. Hist. ii. 1826, 68.

Arvicola hortensis, Harlan, Fn. Amer. 1825, 138.

Arvicola ferrugineus, Harl., Am. Journ. Sc. x. 1826, 285 (rusty var.).

Arvicola texiana, Aud. and Bach., Q. N. A. iii. 1853, 229, pl. exlvii. fig. 2 (not *A. texiana*, *Id.*, *ibid.* 319, which is *Hesperomys leucopus*).

Sigmodon berlandieri, Bd., P. A. N. S. P. vii. 1855, 333; M. N. A. 1857, 504; Mex. B. Surv. ii. 1859, 44, pl. vi. f. 2, 2a (Texas and Mexico).—Tomes, P. Z. S. 1861, 281 (Guatemala).

Hesperomys (Deilemys) toltecus, De Saussure, R. & M. Z. 1860. p. —, pl. ix. f. 3a (Vera Cruz).

HAB. Southern United States and Mexico, especially coastwise. South to Guatemala.

Obs. Occupying a considerable stretch of country that affords very different climatic conditions, this species changes insensibly from reddish-brown lined with black, beneath whitish, tail rarely equalling the body alone, and hind foot not over 1.30 or under 1.10 (typical *hispidus*), to a grayer brown, with purer white under parts, tail sometimes equalling body and head, hind foot sometimes 1.37 ("*berlandieri*"); and this to an animal like the first in colors and proportionate length of tail, but the hind foot not over 1.10, sometimes only 0.95 ("*toltecus*").

Genus IV. **HESPEROMYS**,¹ Waterh., emend.

SYN. *Mus*, sp., Aud.—*Arvicola*, sp., Harl., Am. Monthly Journ. 1832, 446 (*nuttalli*); Aud. & Bach., Q. N. A. (*sonoriensis* Le C., *texana*, Woodh., and *oryzivora*, Aud. and Bach.).—*Hypnæus*, sp., Maxim.

¹ In proposing *Hesperomys*, Waterhouse obviously intended only to separate the New World mice collectively from those of the Old World, on the difference in the dentition. This is evident throughout his article in the Voyage of the Beagle. Though treating only of South American species, he is at pains to say in one place that "*Mus leucopus*, *Neotoma* and *Sigmodon* certainly belong to the same group." As instituted, *Hesperomys* is precisely coequal with the tribe or series *Sigmodontes* as contrasted with typical Old World *Mures*. It includes in South America, *Calomys* (*Eligmodontia*, F. Cuv.), *Habrothrix*, *Phyllotis*, *Scapteromys*, *Oxymycterus*, *Holochilus*, and *Reithrodon*; in North America, the "*Hesperomys*" of our authors, *Onychomys*, *Oryzomys*, "*Reithrodon*" of our authors, *Sigmodon*

Reise, ii. 1841, 99 (*leucogaster*).—*Musculus*, Raf., Am. Monthly Mag. iii. 1818, 446 (*leucopus*).—*Hesperomys*, Waterh., Zool. Voy. Beag. 1839, 75 (established for the New World mice collectively, and therefore equivalent to the tribe *Sigmodontes* as now understood).—*Calomys*, Aud. and Bach., Q. N. A. ii. 1851, 303 (*aureolus*).—*Onychomys*, Bd., M. N. A. 1857, 458 (*leucogaster*, Maxim.).—*Oryzomys*, Bd. *op. et loc. cit.* (*palustris* Harl.).

and *Neotoma*. Naturalists soon perceived the supergeneric value of this assemblage, and sought to eliminate various groups under other generic appellations. Waterhouse himself established a number of divisions which, with some modifications, have been generally accepted. In North America, *Sigmodon* and *Neotoma*, with the so-called "*Reithrodon*," stand well apart from *Hesperomys*; in South America, *Holocheilus* and the true *Reithrodon* seem perfectly distinct. The rest of the American mice (at least so far as I know them) most probably fall under a restricted genus *Hesperomys*; we have only to tie this name down to the strict value of a genus, pin it to its type, and establish among the numerous species what subgeneric divisions we can. From the circumstances of its founding it is difficult to say what should be considered the type of *Hesperomys*. Waterhouse, in drawing his comparisons between *Mus* and the New World mice, took *M. rattus* and *M. bimaculatus* for such purpose; we may properly therefore elect the latter as technically the type. But when Waterhouse, in 1837, established *Calomys* upon *C. elegans*, he included in it both *bimaculatus* and *gracilipes*; and *Eligmodontia* of F. Cuvier is strictly coequal. It becomes a question whether one of these names should not stand in place of *Hesperomys* as restricted; but as the latter is firmly established, as *Calomys* is by the same author, and as *Eligmodontia* is no earlier, there may be no necessity for a change. Resting then upon this strict application of *Hesperomys* to such species as *bimaculatus*, *elegans*, and *gracilipes*, we may inquire how nearly, if at all, the North American Vesper-mice agree with it. In his essay of 1857, Prof. Baird elaborately details the characters of the South American species, and, excluding *Reithrodon* and *Holocheilus* as full genera, makes *Hesperomys* to include three subgenera, viz., *Calomys* Waterh., *Habrothrix* (= *Habrothrix plus Phyllotis*, Waterh.) and *Oryzomys* (= *Oryzomys plus Scapteromys*, Waterh.). Among North American forms, he establishes three subgenera, *Hesperomys*, *Onychomys*, and *Oryzomys*. I confirm these last unequivocally; the only point being whether the *leucopus* group, which Baird left in *Hesperomys*, is not also a group subgenerically different from that including *elegans*, *bimaculatus*, etc. All the North American mice seem to be differentiated from those of South America by characters of more than specific importance; the closest approach that I am aware of being found in the *leucopus* group, a species of which—*nuttalli*, yellowish underneath—comes near *Calomys*.

I propose to retain *Hesperomys* for all the North as well as certain South American species, and to divide the former into three subgenera; *Vesperinus*, Mihi, *Onychomys*, Baird, and *Oryzomys*, Baird.

Subgenus VESPERIMUS, Coues.

SYN. *Musculus*, Raf., Am. Month. Mag. iii. 1818, 446 (used in connection with *leucopus*, but ineligible for obvious reasons).—*Hesperomys*, Baird (with exclusion of *Onychomys* and *Oryzomys*).—*Calomys*, Aud. and Bach. Q. N. A. ii. 1851, 303 (type *aureolus*; not of Waterhouse).

Char. Teeth strictly sigmodont. Back upper border of orbit not beaded (compare *Onychomys* and *Oryzomys*). Coronoid not attaining level of condyle. Cranial and dental characters in general strictly those of *Hesperomys*. Small but well-developed cheek-pouches! Of medium and small size, lithe form and quick movement. Eyes large, prominent. Snout pointed. Ears large, rounded, thin, scantily and finely pilous; antitragus evident but not valvular. Fore feet hardly or not half as long as the hinder; palms naked; fore claws not larger than the hinder; digits slender, 3d and 4th subequal and longest, 2d and 5th successively much shorter. Hind feet long, slender; soles 6-tuberculate, naked or scant-furred on the posterior third; 2d, 3d, and 4th subequal and much the longest, 5th shorter; 1st shortest. Tail terete, slender, closely hairy, ranging in length from as long as body alone to a little longer than head and body. Pelage soft, close, glossy, with but few longer bristly hairs; feet and under parts white or whitish; body and tail more or less distinctly bicolor. No woolly tufts of hair about the ears. Type, *V. leucopus*. (Compare diagnoses of *Onychomys* and *Oryzomys*.)

Obs. Among the multitude of species of this group ascribed to North America, I can recognize as distinct but the few following, having proven to my entire satisfaction the complete intergradation of the others.

1. *Hesperomys (Vesperimus) leucopus*, (Raf.) Le Conte.

SYN. *American Field Mouse or Rat*, Penn., Syn. 1771, No. 303; Hist. Quad. 1781, No. 302; Arct. Zool. i. 1784, 131.

American Wandering Mouse, Barton, Med. and Surg. Journ. Phila. i. 1805, p. 31.

Mus sylvaticus, var., Erxl., Syst. Av. i. 1775, 390 (based on "New York var." of Pennant).

Mus sylvaticus, var. *noveboracensis*, Fisch., Syn. 1829, 318 (the same).

Mus noveboracensis, Selys-Longch., Études Microm. 1839, 67.

Mus agrarius, var. *americanus*, Kerr's Linn. 1792, 231 (based on Pennant).

Mus agrarius, Godman, Am. Nat. Hist. i. 3d ed. 1860, 316 (also in the earlier editions).

Crictus myoides, Gapper, Zool. Journ. v. 1830, 204, pl. 10 (Canada).

Hesperomys myoides, Baird, M. N. A. 1857, 472 (Vermont, based on Gapper¹).

Arvicola emmonsii, DeKay, Rep. Quad. Mass. 1840, 61.

Musculus leucopus, Raf., Amer. Month. Mag. iii. 1818, 446.

Mus leucopus, Desm., Mamm. ii. 1822, 307; and of authors.

Hesperomys leucopus, Lc C., P. A. N. S. P. vi. 1852, 413, and of authors.

Hesperomys maniculatus, Wagn., Wieg. Arch. ii. 1843, 141, and ii. 1845, 148; Abh. Akad. Wissen., v. 1848, 316 (Labrador).

Hesperomys polionotus, Wagn., Wieg. Arch. ii. 1843, 52 (Georgia).

Hesperomys campestris, Lc C., P. A. N. S. P. vi. 1853, 413 (New Jersey).

Hesperomys texanus, Woodh., P. A. N. S. P. vi. 1853, 242 (Texas).

Hesperomys cognatus, Lc C., P. A. N. S. P. vii. 1855, 442 (Southern States).

Hesperomys gracilis, Lc C., P. A. N. S. P. vii. 1855, 442 (Northwest States).

Hesperomys austerus, Bd., P. A. N. S. P. vii. 1855, 336 (Washington Territory).

Hesperomys boylii, Bd., P. A. N. S. P. vii. 1855, 335 (California).

Hesperomys gambeli, Bd., M. N. A. 1857, 464 (Pacific Coast, U. S.).

?*Hesperomys indianus*, Maxim., Arch. f. Naturg. xviii. 1862, 111 (*vide* Allen).

[Note.—The above synonymy is exclusive of the several geographical varieties of this species which may be recognized.]

Hab. North America generally.

1a. *Hesperomys* (*Vesperimus*) *leucopus gossypinus* (Lc C.).

SYN. *Hesperomys gossypinus*, Lc Conte, P. A. N. S. P. vi. 1853, 411 (Georgia).

Hypudæus gossypinus, Lc C., McMurtrie's Cuvier, i. 434, App.

Hab. South Atlantic States.

1b. *Hesperomys* (*Vesperimus*) *leucopus sonoriensis* (Lc C.).

SYN. ? *Mus leucopus*, Rich., Zool. Journ. iii. 1818, and F. B. A. i. 1829, 142.

Hesperomys sonoriensis, Lc C., P. A. N. S. P. vi. 1853, 413 (Sonora).

Hesperomys sonoriensis, var. *nebrascensis*, Bd. M. N. A. 462, in text.

Hab. Interior of North America, west of the Mississippi, from Arctic Regions to Mexico (usually occupying this range to the

¹ The presence of cheek pouches, supposed to remarkably distinguish this animal, I have determined in *all* the species of *Vesperimus* examined. It is an interesting question whether they also occur in South American forms.

exclusion of typical *leucopus*, but associated with it in some localities).

1c. *Hesperomys (Vesperimus) leucopus eremicus* (Bd.).

SYN. *Hesperomys eremicus*, Bd. M. N. A. 1857, 479.—Coues, Quad. of Arizona, Am. Nat. i. 398.

Hab. Valleys of the Colorado and Gila Rivers.

Obs. The soles in this variety, and in species No. 4, are quite naked, but merely as an incident of their desert habitat.

2. *Hesperomys (Vesperimus) aureolus*, (Aud. & Bach.) Wagn.

SYN. *Mus (Calomys) aureolus*, Aud. & Bach., J. A. N. S. P. vi. 1842, 302; Q. N. A. ii. 1851, 303, pl. 95.

Hesperomys aureolus, Wagn., Wieg. Arch. ii. 1843, 51.

? *Arvicola nuttalli*, Harlan, Am. Month. Journ. 1832, 446; Med. and Phys. Res. 1835, 55, pl. 00.

Hesperomys nuttalli, Baird, M. N. A. 1857, 467.

Hab. Central and Southern States.

3. *Hesperomys (Vesperimus) michiganensis*, (Aud. & Bach.) Wagn.

SYN. *Mus michiganensis*, Aud. & Bach. J. A. N. S. Phila. viii. 1842, 304; Quad. N. A. iii. 1854, 326.

Hesperomys michiganensis, Wagn., Wieg. Arch. ii. 1843, 51.

Mus bairdii, Hoy & Kenn., U. S. Patent Office Rep. Agric. for 1856, (1857) 92, pl. xi.

Hab. Upper Mississippi Valley, especially Illinois, Michigan, and Wisconsin.

4. *Hesperomys (Vesperimus) californicus*, (Gambel) Baird.

SYN. *Mus californicus*, Gamb., P. A. N. S. P. iv. 1848, 78 (Monterey).

Hesperomys californicus, Baird, M. N. A. 1857, 478.

Hesperomys parasiticus, Cooper's MSS., Bd., op. cit. 479 (in text).

Hab. Southern and Lower California.

5. *Hesperomys (Vesperimus)*¹ *aztecus*, De Sauss.

SYN. *Hesperomys aztecus*, De Sauss., R. M. Z. 1860, p. 00 (p. 22 of the reprint).

Hab. "Mexico." Cape St. Lucas.

Obs. This species appears to belong strictly to the *Vesperimus* group. It is about the size and form of *V. leucopus*, but the tail is nearly naked and scarcely bicolor, while the colors are notably different; they differ just as those of *Neotoma ferruginea* do from

¹ I have not determined the presence of cheek pouches in this or the succeeding species; in all other respects they are truly *Vesperimus*, and they doubtless possess them.

those of *N. floridana*, in rich rusty-red on the sides and partly dusky metatarsus.

To the foregoing list I append the description of an apparently new species of this group:—

6. *Hesperomys (Vesperimus) melanophrys*, Coues, n. s.

SYN. ?? *Hesperomys mexicanus*, De Sauss., R. M. Z. 1860, p. 00 (p. 20 of reprint), pl. ix. figs. 1, 1a.

Descr. from No. 10,183, Mus. Smiths., Sta. Efigenia, *Sumichrast*. General aspect of a species of the *leucopus* group. Large; nose to eye 0.62 (inches and hundredths), to ear 1.12, to occiput 1.40, to tail 4.15; tail 5.00; fore foot 0.42; hind foot 1.04; ear 0.78 above notch. Tail a little longer than head and body, slender, scant-haired. Absolute and relative proportions of feet and digits as in *V. leucopus*; soles hairy on posterior third. Ears large, leafy, apparently naked, really closely pilous. Whiskers reaching to or beyond the shoulder. Skull strictly as in *V. leucopus* (palate ending opposite last molars, not far behind it as in *Mus*, *Oryzomys*, etc.), but not quite so thin and papery, and developing a slight bead on the orbital border, as in the stouter mice generally. Color above giving the general impression of a gray mouse, rather than a red mouse with darker dorsal area as in *leucopus* and *aztecus*. It is gray, brightened with fulvous, slightly darker along the back, more decidedly fulvous laterally, and everywhere with a peculiar slight glaucous or hoary shade. Head noticeably purer gray; eye encircled with a black ring in marked contrast, the edges of the lids, and a little anteorcular spot, being jet black. (This suggests the specific name; I have seen nothing like it elsewhere.) Color below, pure white, the plumbeous roots of the hairs, however, giving a slight grayish cast. Line of demarcation of this white with the color of the upper parts everywhere abrupt. Outside of fore leg colored to the very wrist, but back of the hand white. Hind leg also colored to and a little beyond the ankle, forming a definite dark spot on the base of the metatarsus, the remaining five-sixths of the foot being pure white. Tail above, like the back; below, gray—not white; and the line of demarcation, though evident, not sharp. No yellowish or fulvous tinge anywhere on the under parts (“*mexicanus*” of De Saussure is said to be yellowish on the chin and breast). Skull 1.20 long by 0.64 broad.

Obs. This may just possibly be *H. mexicanus* of De Saussure, but I cannot so identify it, and prefer to err on the safe side, if at all. Besides the above specimen, I have others from Tehuacan and Tehuantepec. It is nothing like any of the foregoing North American species. A female shows three pair of mammae—one axillary, two inguinal.

Subgenus *ONYCHOMYS*, Baird.

Syn. *Hypudæus*, sp., Maxim., Reise, ii. 1841, 99, *nec auct.* *Mus*, sp., Aud. & Bach., Q. N. A. ii. 1851, 327 (*missouriensis*), *Hesperomys* subg. *Onychomys*, Baird, M. N. A. 1857, 458 (type *Hypudæus leucogaster*, Maxim.).

Diag. Skull strictly as in *Hesperomys* (*Vesperimus*), but molars larger with sharper saliências and re-entrances. Coronoid attaining level of condyle. External form somewhat approaching the arvicoline in stoutness, and in shortness of tail and ears. Tail in type of the genus not one-half the length of the body alone—little if any longer than the head, very thick and tapering to an obtuse point. Ears about as in the arvicoline genus *Evotomys* (*Hypudæus* of Baird). Fore feet very large, $\frac{2}{3}$ to $\frac{1}{2}$ as long as the hinder, with long, little curved, almost fossorial claws, longer than those of the hind feet. Soles quadrituberculate only—densely furry to the tubercles. White beneath, as in typical *Vesperimus*. A strongly differentiated form! To the type of this section (*Hypudæus leucogaster* of Maximilian, afterward *Mus missouriensis* of Audubon) I add a peculiar variety—more probably a second species. The two may be thus distinguished:—

a. Tail much less than half the head and body, scarcely twice the hind foot. Fore foot more than half the hind foot. Ear about 0.50 high. Beneath snow-white; above mouse-brown with darker dorsal area.

LEUCOGASTER.

b. Tail nearly half the head and body, about $2\frac{1}{2}$ times the hind foot. Fore foot only half the hind foot. Ear about 0.75 high; beneath tawny white; above brownish fulvous without darker dorsal area.

(var ?) *TORRIDUS*.

7. *Hesperomys* (*Onychomys*) *leucogaster*, (Maxim.) Baird.

Syn. *Hypudæus leucogaster*, Maxim., Reise, ii. 1841, 99 (Fort Clark). *Hesperomys* (*Onychomys*) *leucogaster*, Bd., M. N. A. 1857, 480. (Nebraska.)

Mus missouriensis, Aud. & Bach., Q. N. A. ii. 1851, 327, pl. 100. (Fort Union, Montana.)

Hab. Interior of United States, between Mississippi and Rocky Mountains. Upper Missouri. Red River of the North (*Coues*). Wyoming. Kansas. Doubtless of more extended, but as yet unascertained range.

8. *Hesperomys (Onychomys) torridus*, *Coues*.

Diag. Resembling *O. leucogaster*; tail longer, ears larger, soles less hairy, fore claws weaker. Coloration much more yellowish; no darker dorsal area; snout, feet, and all under parts tawny-white; dusky stripe on top of tail very narrow, not reaching the tip. Length of head and body 3.75; of tail 2.00; of fore foot 0.40; hind foot 0.80; ear about 0.75 above notch. Only two pair (inguinal) of teats discovered. (Type No. 9886, Mus. S. I.)

Hab. Arizona.

Subgenus *ORYZOMYS*, Baird.

SYN. *Mus*, sp., Harl., Am. Journ. Sci. 1837.—*Hesperomys*, sp., Wagn. Suppl. Schreber, 1843, and authors.—*Arvicola*, Aud. & Bach., Q. N. A. iii. 1853.—*Oryzomys* (subg.), Bd., M. N. A. 1857, 458 (type *Mus palustris*, Harl.).

Char. Orbits beaded. Anteorbital foramen nearly circular above (somewhat as in *Jaculus*) continued slit-wise below, where narrower than in *Vesperimus*; the maxillary plate bounding it not produced into a pointed process (compare *Sigmodon*.) Palate produced behind last molars—a deep pit on either hand. Coronoid attaining level of condyle. Hind legs short, but feet very large, with obliquely set toes (much as in *Fiber*) in evident adaptation to aquatic habits. Soles perfectly naked, granular, with one long, narrow, postero-internal tubercle (as in *Mus* and five small ones. Toes with evident basal webbing; very unequal in length, the fifth reaching to the penultimate joint of the fourth (compare *Sigmodon*). Fore feet not half as long as the hinder; palms perfectly naked. Ears small, little overtopping the fur, hairy both sides, with a fluffy tuft in the concavity. Nasal pads more evident than in other sections. Tail long, about equalling the head and body, seant haired; the dermal scales and vertebral rings evident. Fur glossy, but coarse and hispid. Larger than any other N. American species of *Hesperomys*; general aspect of *Sigmodon* or even *Mus* proper.

9. *Hesperomys (Oryzomys) palustris*, (Harlan) Baird.

SYN. *Mus palustris* Harl., Am. Journ. Sci., xxxi. 1837, 386 (New Jersey).

Hesperomys palustris, Wagn., Suppl. Schreber, iii. 1843, 543.

Hesperomys (Oryzomys) palustris, Bd., M. N. A. 1857, 482.

Arvicola oryzivora, Aud. & Bach., Q. N. A. iii. 1853, 214, pl. 144, f. 3.

Hab. South Atlantic and Gulf States, north to New Jersey. Kansas! (Goss). Tehuantepec (*Sumichrast*). Jamaica?

Genus IV. **OCHETODON**, Coues, n. g.

SYN. *Mus*, sp., Aud. & Bach.—*Hesperomys*, sp., Wagner.—*Reithrodon*, Le Conte, P. A. N. S. P. 1853, 413, and Baird, M. N. A. 1857, 447, but not of Waterhouse.

Diag. Form murine (general appearance of *Mus musculus*). Size minute. Skull as in *Vesperimus*; coronoid not attaining level of condyle. Tail about as long as head and body. Upper incisors grooved (unique character among N. American *Murinae*). Front upper molars with four roots instead of three, as in *Hesperomys*.

Obs. The occurrence in North America of sigmodont mice with sulcate incisors was first noticed in 1841 by Audubon and Bachman, who described *Mus humilis*. Their animal was soon referred to *Hesperomys* by Wagner. But the peculiarity of the upper incisors was overlooked until 1853, when Maj. Le Conte took up the point and referred a species to the South American genus *Reithrodon*—a course followed by Prof. Baird in 1857, when the latter described three supposed new species, *R. montanus*, *megalogotis*, and *longicauda*. But sulcation of the incisors is almost the only character that *Ochetodon* shares with *Reithrodon*; the two genera are otherwise widely different.¹

¹ *Reithrodon*, Waterh., P. Z. S. 1837, 29; Zool. Voy. Beag. 1839. Type *R. cuniculoides*.

Diag. Upper incisors sulcate. Rostral portion of the skull large in proportion to the cranial, producing a high, convex forehead; zygomatic width of skull about $\frac{2}{3}$ its length; interorbital portion narrow; posterior nares contracted from close approximation of the pterygoids; palate with lateral paired fossæ, and ending nearly opposite or beyond the last molar; incisive foramina very long, extending to or beyond the first molar; coronoid process small and exflected; condylar narrow and very oblique; descending process large, subquadrate, the emargination between this and the condyle deep. Size large; form stout and compact; head broad and arched; eyes large and prominent; ears moderate, pilous; soles hairy behind; lateral toes subequal and extremely short; tail short, about one-half the head and body, moderately hairy.

Analysis of Species of Ochetodon.

- A. Tail shorter than head and body (at most barely as long).
Hind feet under 0.70 long (usually 0.55 to 0.65). HUMILIS.
- B. Tail longer than head and body.
Hind feet under 0.70 (exceptionally = 0.70). LONGICAUDA.
Hind feet over 0.70 (rarely, if ever = 0.70). MEXICANA.

1. *Ochetodon humilis*, (Aud. and Bach.) Coues.

SYN. *Mus humilis*, Aud. and Bach., P. A. N. S. P. i. 1841, 97; J. A. N. S. P., viii. 1842, 300; Q. N. A., ii. 1851, 103, pl. lxxv. (South Atlantic States.)

Hesperomys humilis, Wagner, Wieg. Arch. 1843, 51.

Reithrodon humilis, Bd., M. N. A., 1857, 448.

Mus leontii, Aud. and Bach., J. A. N. S. P. viii. 1842, 307; Q. N. A. iii. 1854, 324 (no fig.). (South Carolina.)

Hesperomys leontii, Wagn., Wieg. Arch. 1843, 51.

Reithrodon leontii, Le C., P. A. N. S. P. vi. 1853, 413.

Most of which is widely different from what obtains in *Ochetodon*, the grooving of the incisors being merely a coincidence. Nor am I satisfied that the three supposed species of *Reithrodon* are strictly congeneric. They differ among themselves in cranial as well as external characters, to an extent at least warranting subgeneric separation. In respects of palatal structure and form of the anterior zygomatic root, there is a curious parallelism with the same points in *Sigmodon* and *Oryzomys*. I will tabulate some of the characters, as follows:—

Reithrodon proper. (Type *R. cuniculoides*.) Anterior root of zygoma deeply emarginated in front. Palate ending much behind the molar series, and showing a median ridge between lateral paired excavations. Pterygoid fossæ deeply excavated, and these bones closely approximated. Incisive foramina reaching beyond the first molars. Condylar process of mandible concave internally; descending process rounded off inferiorly; coronoid process very oblique. Species *R. cuniculoides*, Waterh., P. Z. S. 1837, 30, and Zool. Voy. Beag. 1839, pt. ii. p. 69, pl. xxvi. (animal), pl. xxxiii. figs. 2b, 2c, 2d, 2e (teeth), pl. xxxiv. figs. 2a, 2b, 2c (skull), from Patagonia; and a second supposed species *R. typicus*, Id., P. Z. S. 1837, 30; Voy. Beag. 1839, pt. ii. p. 71, pl. xxxiii. fig. 4a (teeth), from La Plata.

Euneomys, Coues, n. subg. (Type *Reithrodon chinchilloides*.) Anterior root of zygoma nearly straight in front. Palate ending nearly opposite the last molars, but slightly ridged or excavated. Pterygoid fossæ shallow; these bones less approximated. Incisive foramen only reaching to first molars. Condylar process of mandible flat internally; descending process angular; coronoid process nearly vertical. Species *R. (E.) chinchilloides*, Waterh., Zool. Voy. Beag. 1839, pt. ii. p. 72, pl. xxvii. (animal), pl. xxxiv. figs. 20a, 20b, 20c, 20d, 20e, 20f (skull and teeth), from Straits of Magellan.

? *Mus carolinensis*, Aud. and Bach., J. A. N. S. P. viii. 1842, 306; Q. N. A. iii. 1854, 332. (South Carolina.)

? *Hesperomys carolinensis*, Wagn., Wieg. Arch. ii. 1853, 51.

? *Reithrodon carolinensis*, Bd., M. N. A. 1857, 452.

Reithrodon megalotis, Bd., M. N. A. 1857, 451; Rep. Mex. B. Surv., ii. pt. ii. 1859, p. 43, pl. vii. fig. 4 a-c, pl. xxiv. fig. 4 a-g. (Sonora.)

Hab. United States, southerly. South Carolina to Texas. Kansas. Missouri. Iowa. Nebraska. Utah. Sonora.

2. *Ochetodon longicauda*, (Baird) Coues.

SYN. *Reithrodon longicauda*, Baird, M. N. A. 1857, 451.—? Tomes, P. Z. S. 1861, 284. (Guatemala.)

Hab. California (? south thence to Guatemala).

3. *Ochetodon mexicanus*, (De Sauss.) Coues.

SYN. *Reithrodon mexicanus*, De Sauss., R. and M. Z. 1860, p. — (p. 27 of reprint).—Tomes, P. Z. S. 1861, 284. (Guatemala.)

Hab. Mexico. Guatemala. Louisiana?

4? *Ochetodon montanus*, (Bd.) Coues (sp. proband.)

SYN. *Reithrodon montanus*, Bd., P. A. N. S. P. vii. 1855, 335; M. N. A. 1857, 449, pl. liv. fig. No. 1306 (teeth). (Rocky Mts., lat. 39°.)

5? *Ochetodon sumichrasti*, (De Saus.) Coues. (sp. proband.)

SYN. *Reithrodon sumichrasti*, De Saus., R. M. Z. 1861, 3. (Mexico.) (Unknown to me.)

Subfamily ARVICOLINÆ.

Molars normally rootless, prismatic, with serrate periphery and flat crowns. Root of under incisor causing protuberance on inside of jaw at or near notch between condyle and descending process. Descending process of mandible hamular, attaining level of molars. Coronoid a long stout hook. Anterior root of zygoma not obviously nicked. Palate highly arched.

Genus V. EVOTOMYS, Coues, n. g.

SYN. *Arvicola*, sp., Auct.—*Myodes*, Selys-Longch., Études de Microm. 1839, 87 (not of Pallas).—*Hypudæus*, Keys. and Blas., Wirbelth. 1842 (type *A. glareola*; not of Illiger, which includes *Mus lemmus*, *amphibius*, etc.).—*Hypudæus* of Baird, M. N. A., 1857, 513, 515, 518 (type *A. gapperi*).—*Evotomys*, Coues (type *Mus rutilus*, Pall.).

Diag. Dentition arvicoline, in flat-topped prismatic molars, but murine in *rooting* of the molars (molars only rooted here among *Arvicolinæ*). Coronoid process of lower jaw not attaining level

of the condyle (unique among *Arvicolinæ*). Bony palate ending in a straight flat shelf opposite middle molars, the whole space between last molars thus left open. General form arvicoline, but ears distinctly overtopping the fur as in *Murinæ*. A strong genus, linking the two subfamilies. There are many peculiarities besides these given.

1. *Evotomys rutilus*, (Pall.) Coues.

SYN. *Mus rutilus*, Pall., N. Sp. Quad. Glir. 1778, 246, pl. xiv. B.

Arvicola gapperi, Dall, Alaska and its Resources, 1870, 577.

Hab. Arctic, circumpolar. Southward in this country this species shades into the following variety:—

1a. *Evotomys rutilus*, var. *gapperi*, (Vig.) Coues.

SYN. *Arvicola gapperi*, Vig. Zool. Journ. v. 1830, 204, pl. 9. (Canada.)

Arvicola (Hypudæus) gapperi, Baird, M. N. A. 1857, 518.

Arvicola fulva, Aud. and Bach., J. A. N. Phil. viii. 1842, 295.
(Name preoccupied.)

Arvicola dekayi, Aud. and Bach., Q. N. A. iii. 1854, 287 (same as their *A. fulva* of 1842). Excl. syn. "*oneida* DeKay" which belongs to *A. riparius*.

Hab. Northern frontier of United States, from Atlantic to Pacific, and adjoining belt of British America. South to Massachusetts.

Obs. This species and its variety are distinguished at a glance by the prominent ears and chestnut coloration.

Genus VI. *ARVICOLA*, Lacép., emend.

SYN. *Mus*, sp., Linn., Syst. Nat. i. 1766, *et auct. antiq.*—*Mures cunicularii*, Pall., N. Sp. Glir. 1778, 77.—*Lemmus*, Linck, Fischer, *et al.*—*Myodes*, Pall., Zoog. R. A. i. 1811, 172 (not *Myodes* of Selys-L., 1839, which = *Hypudæus*, Keys. and Blas. = *Evotomys*, Coues).—*Arvicola*, Lacépède, Tabl. 1803, *et auct. recent.* (includes *amphibius* and *arvalis*).—*Hypudæus*, Ill., Prod. 1811 (not of Keys. and Blas., nor of Baird. Includes *lemmus*, *amphibius* and *arvalis*).—*Myonomes*, Rafinesque, ——— (type "Wilson's Meadow Mouse" = *Arvicola pennsylvanica* of Ord.).—*Psammomys*, Le C., Ann. Lyc. N. Y. 1829, 132 (type *pinetorum*; not of Rueppel).—*Pitymys*, McMurtrie, ed. Cuvier, i. 1831, 434 (type *A. pinetorum*).—*Hemiotomys*, Selys-L., Études, 1839, 85 (*amphibius*, *terrestris*, etc.).—*Microtus*, Selys-L., Études, 1839, 86.—*Pinemys*, Lesson, Nouv. Tabl. R. A. 1842, 12 (type *pinetorum*).—*Hemiotomys*, Bd., M. N. A. 1857, 515 (type *A. riparius*, Ord.).—*Pedomys*, Bd., op. cit. 517 (type *A. austerus*, Le C.).—*Chilotus*, Bd., op. cit. 516 (type *oregonus*, Bach.).

Obs. The limits I would set to *Arvicola* may be gathered from the foregoing, though doubtless some synonyms, and, perhaps, some tenable subgeneric names, of old world forms, have escaped me. Without, therefore, writing out the full diagnosis, I will simply mention characters which separate *Arvicola* as I accept it from the other North American *Arvicolinæ* :—

Molars normally rootless, perennial (*cf. Evotomys*). Folds of enamel fusing at the re-entrances (*cf. Evotomys*). Molars viewed from above about equally serrate on either side (*cf. Myodes, Synaptomys*). Upper molars all subequal in length and breadth (*cf. Myodes, Synaptomys*). Middle lower molar of 4-5 prisms, the last a transverse loop, the rest alternating lateral triangles (*cf. Evotomys*). Back lower molar of not more than 3 prisms seriatim (*cf. Synaptomys, Myodes*), each making a transverse loop. General molar pattern, as to number of prisms to a tooth, as shared by most *Arvicolinæ* (*cf. Cuniculus*). Upper incisors plane (*cf. Synaptomys*). Roots of under incisors running up the condylar process forming a ridge that only subsides near the notch between condyle and descending process (*cf. Synaptomys, Myodes, Cuniculus*). Palate not ending behind in a flat straight-edged shelf (*cf. Evotomys, Myodes, Cuniculus*). Coronoid process as high as condyle (*cf. Evotomys*). Ears moderately developed (*cf. Myodes, Cuniculus*), but not overtopping the fur (*cf. Evotomys*). Tail longer than foot (*cf. Myodes, Cuniculus*). Fore claws of normal size and growth (*cf. Cuniculus*). The species do not turn white in winter (*cf. Cuniculus*). Many other details could be adduced.

The North American species fall in four sections or subgenera, as established by Baird. I use *Myonomes*, Raf., for the section for which Baird employed *Hemiotomys*, Selys, as none of our sections seem exactly the same as any one of Europe. *Pedomys* and *Pitymys* are like each other in skull and dentition, but offer external peculiarities. The sections may be thus analyzed :—

- A. MYONOMES. Back upper molar with 2 external triangles and a posterior crescent. Middle upper molar with 2 internal triangles. Front lower molar with 3 internal and 2 or 3 external lateral triangles. Ears unrimmed in front. Soles 6-tuberculate. Fore claws not longer than the hinder ones. Tail about $\frac{1}{2}$ the length of head and body, or more. Pelage ordinary. Size maximum and medium.
- B. CHILLOTUS. Back upper molar with only 1 external triangle and a posterior trefoil. Middle upper molar with 1 internal triangle. Front lower molar with 3 internal and 2 or 3 external triangles (as in

Myonomes). Ear with a rim in front of meatus, the anterior and posterior roots of the auricle there meeting. Soles 5-tuberculate (?). Fore claws not larger than the hinder. Tail about $\frac{1}{3}$ the head and body. Pelage ordinary. Size minimum.

C. *PEDOMYS*. Back and middle upper molars as in the last. Front lower molar with only 2 internal and 1 external triangle. Ear unrimmed. Soles 5-tuberculate. Fore claws not larger than the hinder. Tail $\frac{1}{3}$ the head and body, or rather less. Pelage ordinary. Size medium.

D. *PITYMYS*. Molars all as in *Pedomys*. Ears unrimmed. Soles 5-tuberculate. Fore claws larger than the hinder. Tail about $\frac{1}{4}$ the head and body, or less. Pelage dense, silky, mole-like. Size small.

Subgenus MYONOMES, Raf.

SYN. *Arvicola* of most American writers.—*Arvicola*, A, *Hemiotomys*, Baird, M. N. A. 1857, 515 (type *riparius*. Not of Selys-L.). —*Myonomes*, Raf. — (type *M. pratensis*, Raf., based on "Wilson's Meadow Mouse" = *A. pennsylvanica*, Ord. = *A. riparius*, Ord.).

1. *Arvicola* (*Myonomes*) *riparius*, Ord.

SYN. *Campagnol or Meadow Mouse of Pennsylvania*, Warden, Descr. U. S., v. 625.

Meadow Mouse, Wils., Am. Orn., vi. pl. 50, f. 3.

Arvicola pennsylvanica, Ord, Guthrie's Geog. 2d Am. ed. ii. 1815, 292 (based on the foregoing).—Harlan, Fn. Amer. 1825, 144 (in part; quotes Ord, but describes *pinetorum*).

Arvicola riparius, Ord, J. A. N. S. P. iv. 1825, 305. (Philadelphia.)

Arvicola riparius longipilis, Kenn., Agric. Rep. U. S. Patent Office, 1856, 304. (West Northfield, Ill.; in winter pelage.)

Arvicola xanthognatha, Harlan, Fn. Amer. 1825, 136 (also of Godman, Say, DeKay, and Linsley, but not of Leach nor of Richardson).

Arvicola alborufescens, Emmons, Rep. Quad. Mass. 1840, 60 (albino).

Arvicola hirsutus, Emmons, l. c.

Arvicola nasuta, Bachm., J. A. N. S. Phila. viii. 1842, 296. (Massachusetts.)

Arvicola oneida, DeKay, N. Y. Fn. i. 1842, 88, pl. xxiv. f. 1. (New York.)

Arvicola rufescens, DeKay, op. cit. 85, pl. xxii. f. 1. (New York.)

Arvicola occidentalis, Peale, Mamm. U. S. Ex. Ex. 1848, 45. (Puget Sound.)

Arvicola californica, Peale, op. cit. 46. (California.)

Arvicola montana, Peale, op. cit. 44. (California.)

Arvicola edax, Le C., P. A. N. S. P. vi. 1853, 405. (California.)

Arvicola borealis, Le C., op. cit. 407. (Rhode Island.) (Not of Rich.)

Arvicola trowbridgei, Bd., M. N. A. 1857, 529 (in text). (California.)

Arvicola longirostris, Bd., op. cit. 530. (California.)

Arvicola modesta, Bd., op. cit. 535. (Rocky Mts.) (Very young.)
Arvicola rufidorsum, Bd., op. cit. 526. (Mass.) (Reddish specimen.)
Arvicola breweri, Bd., op. cit. 525 (Muskeget, Mass.; bleached insular race).

1a. *Arvicola* (*riparius* var.?) *borealis*, Rich. ?

SYN. ?*Arvicola borealis*, Rich., Zool. Journ. 1828, 517; F. B. A. i. 1829, 127.—Also of Aud. and Bach., and of Baird.

Hab. Northwestern America.

Obs. This and the two succeeding species are presented provisionally.

2. *Arvicola* (*Myonomes*) *townsendii*, Bach.

SYN. *Arvicola townsendii*, Bach., J. A. N. S. P., viii. 1839, 63, and of subsequent writers.

Hab. Oregon and Washington Territories.

3. *Arvicola* (*Myonomes*) *xanthognathus*, Leach.

SYN. *Arvicola xanthognatha*, Leach, Zool. Misc. i. 1814, 60, pl. 26.—Rich., F. B. A. i. 1829, 122.—Aud. and Bach., Q. N. A. iii. 1853, 67, pl. 125.—Bd., M. N. A. 1857, 552.—Dall, Alaska and its Resources, 1870, 577.—Whether of Sabine? but certainly not of any author treating of United States species.

Hab. British America.

Obs. In its typical condition the animal is unmistakable in its immense size (up to 8 inches long) and chestnut cheeks. There remain, however, some points to be elaborated before the relationship of the several forms of *Myonomes* can be considered established.

Subgenus *CHILOTUS*, Baird.

SYN. *Chilotus*, Baird, 1857. Type, *A. oregoni*, Bach.

4. *Arvicola* (*Chilotus*) *oregonus*, Bach.

SYN. *Arvicola oregoni*, Bach., J. A. N. S. P., viii. 1839, 60.—Aud. and Bach., Q. N. A. iii. 1853, 232, pl. clxvii. f. 3.—Bd., M. N. A., 1857, 537.

Hab. Oregon.

Subgenus *PEDOMYS*, Baird.

SYN. *Pedomys*, Bd., M. N. A. 851, 517. Type, *A. austerus*, Lc C.

5. *Arvicola* (*Pedomys*) *austerus*, Lc C.

SYN. *Arvicola austerus*, Lc C., P. A. N. S. P. vi. 1853, 405. (Wisconsin.)

Arvicola (*Pedomys*) *austerus*, Bd., M. N. A. 1857, 532, pl. liv. (Wisconsin and Missouri to Louisiana.)

Arvicola (Pedomys) cinnamoma, Bd. *op. cit.* 541, pl. liv. (Minnesota.)

Arvicola (Pedomys) haydeni, Bd., *op. cit.* 543. (Nebraska.)

Hab. Western States and adjoining Territories, especially Illinois, Missouri, and Michigan. Kansas. Louisiana.

5a. *Arvicola (Pedomys) austerus*, var. *curtatus*, Cope.

SYN. *Arvicola curtata*, Cope, Pr. A. N. S. Phila. 1868, 2. (Owen's Valley, California.)

Hab. United States, west of the Mississippi. California. Colorado. Kansas and Nebraska, where becoming mixed up with true *austerus*.

Obs. In comparing his supposed new species with "*A. modesta*," Prof. Cope was misinformed as to its affinities. It is a true *Pedomys*, not in the least like any style of *Myonomys*, as I ascertain by inspection of the type specimen. Its extreme modification is peculiar in the small size, and very short tail (less than the head): it shades directly into ordinary *austerus*.

Subgenus *PITYMYS*, McMurtrie.

SYN. *Psammomys*, Le C., 1829, *nec Rüppel* (type *pinetorum*).—*Pitymys*, McMurt., 1831 (same type).—*Pinemys*, Less, 1831 (same type).

6. *Arvicola (Pitymys) pinetorum*, Le Conte.

SYN. *Arvicola pennsylvanica*, Harl., Fn. Amer. 1825, 144, in part; the descr. but not the synon. (*not of authors*).

Psammomys pinetorum, Le C., Ann. Lyc. N. Y. iii. 1829, 132, pl. ii.

Pitymys pinetorum, McM., Am. ed. Cuvier, i. 1831, 434.

Pinemys pinetorum, Less., Nouv. Tabl. R. A. 1842, 12.

Arvicola pinetorum, Aud. and Bach., Q. N. A. ii. 1851, 216, pl. lxxx. (excl. syn. "*oneida* DeKay.")

Arvicola (Pitymys) pinetorum, Bd., M. N. A. 1857, 544.

Arvicola scalopsoides, Aud. and Bach., J. A. N. S. Phila. viii. 1842, 299 (Long Island).

Arvicola apella, Le C., P. A. N. S. P. vi. 1853, 405. (Pennsylvania.)

6a. *Arvicola (Pitymys) pinetorum*, var. *quasiater*, Coues, n. v.

Diag. Subgeneric characters of *Pitymys* (skull not seen), and somewhat resembling *P. pinetorum* (particularly the large dark style formally called *scalopsoides*). Rieh glossy blackish, appearing quite black at first sight, but this color warmed into a slight auburn shade by uniform admixture of dusky chestnut or chocolate brown. No markings anywhere; color of the upper parts changing on the sides insensibly into blackish-ash or dark plumbeous of the under parts, which are slightly hoary. Tail like back

above, indistinctly paler below. Fur short, close, of so rich silky lustre that in some lights an appreciable purplish or coppery iridescence is seen. General build of *pinetorum*; rather stouter, larger; nose to eye 0.50; to ear 1.05; to tail 4.33-4.45; tail vertebrae 0.70; with hairs 0.80; height of ear in front 0.45; palm 0.33; sole 0.66.

Hab. Mexico. (Xalapa, *De Oca*, No. 3524, Mus. S. I., type of the species; Tuxpango, *Sumichrast*, No. 7006, Mus. S. I.)

Obs. This peculiar field mouse, which may prove entirely distinct from *pinetorum*, is specially interesting in coming from a region where the genus was long supposed to be not represented. I have never seen any other *Arvicola* from south of the United States, nor is there, to my knowledge, but a single one hitherto described from so low a latitude, on this hemisphere at least. This is *Arvicola* (*Hemiotomys*) *mexicanus*, De Sauss., R. M. Z. 1861, 3, a species apparently allied to *A. riparius*.

Genus VII. SYNAPTOMYS, Baird.

Srx. *Synaptomys*, Bd., M. N. A. 1857, 558, in text under *Myodes*, and p. xlv.

Diag. Superior incisors grooved (unique in the subfamily). Root of inferior incisor ending abruptly opposite last lower molar (the root generally runs up to the condyle in *Arvicolinæ*). Construction of molars, and general cranial characters as in *Myodes*. Palate ending as in typical *Arvicola*. External characters in general of an ordinary arvicoline style, but in the very long soft full pelage, short heavy head, and blunt muzzle, approaching the Lemmings; nevertheless, ears equalling or overtopping the fur as in *Evotomys*, and tail equally or exceeding the hind foot, as usual in *Arvicola*.

Obs. Foregoing are the essential characters of the most remarkable genus of the subfamily, one singularly combining peculiarities of several widely different arvicoline genera. It may be defined in a word as skull and teeth of *Myodes*, in body of *Arvicola*, with ears of *Evotomys*, and *sui generis* sulcation of upper incisors. The genus was happily characterized in 1857, but upon such miserably inadequate material,¹ that Prof. Baird did not formally

¹ No. ¹³⁶⁷/₂₃₃₆, Mus. S. I., merely a rat-eaten bunch of fur, lacking head, tail, and three of the feet, with a defective skull; and No. 1368, skin with feet and tail, but no head, and no skull. Locality unknown, supposed United States. Received from Wm. Cooper.

introduce either genus or species in the body of his work, though in the introductory list he gives *Synaptomys* as a subgenus of *Myodes* and catalogues a species, *S. cooperi*. Though defined with precision, as far as the material would allow, the genus remains little known. I can indorse it unequivocally, and add all details hitherto wanting. There is probably no more strongly marked genus of *Arvicolinæ*.

The groove of the upper incisor is deep, distinct, and runs near the outer edge instead of along the middle (as in *Ochetodon* and *Reithrodon*). The incisors are short, broad, and much curved; their front much bevelled off, so that, viewed in profile, one part of each incisor stands in front of and parallel with the part on the other side of the groove. These teeth tend to the *Myodes* pattern further in being enamel tubes not completely filled with dentine (calling to mind an unfinished quill pen, after the first oblique slice is cut away); their tips are not straightly transverse, and generally nicked at the end of the groove. The under incisors, exactly as in *Myodes*, stop as to their roots abruptly just in front and inside of the last lower molar; while in all other *Arvicolinæ* I have examined, excepting *Myodes* and *Cuniculus*, the root runs past (outside) the lower molar up the ramus of the jaw to near the condyle, this passage of the root making an obvious ridge, here wanting. In *Synaptomys*, as in the genera just mentioned, the whole condylar ramus is thus flat, with its inner surface nearly plane, separated by a strong sulcus from the end of the alveolar portion of the jaw.

As is well known, the molars of *Myodes* (restricted to exclude *Cuniculus*), though essentially aggregated rootless prisms as in other *Arvicolinæ*, are quite different in their details of pattern. Not to go here into detail, I may simply say, that the inner margin of the molar series is *crenate*, not sharply serrate like the outer as in *Arvicola*. Now this pattern of *Myodes* is duplicated in *Synaptomys*, and so is every other molar detail. Incisors aside, the skull and teeth of *Synaptomys* are not distinguishable with certainty from those of *Myodes*. Outside, *Synaptomys* is not a lemming, but an *Arvicola*, one, too, with ears as large as in *Evoptomys*. An alcoholic specimen might be mistaken at first sight for *Arvicola austerus*. One might suppose it originally a lemming, stranded in time long past in latitude so low as to impress upon it ordinary arvicoline exterior characters.

Measurements of a skull of Synaptomys cooperi (No. 6915, Mus. S. I., Kansas, B. F. Goss). Total length (occip. protub. to end of nasals) 1.14; greatest zygomatic width, 0.72; least width (at interorbital constriction) 0.15; width of rostrum, 0.25; intermastoid width 0.58; interparoccipital width 0.37; height opposite and including last molar, without lower jaw, 0.45; length of upper molar series 0.30; length of extra-alveolar portion of upper incisors 0.24; length of rostrum 0.25; tip of under incisors to apex of coronoid 0.62, to back of condyle 0.79, to end of descending process 0.81; length of under molar series 0.28; of extra-alveolar portion of under incisor 0.25.

1. *Synaptomys cooperi*, Baird.

Myodes (*Synaptomys*) *cooperi*, Bd., M. N. A. 1857, p. xlv.

Synaptomys cooperi, *op. cit.* 558, in text.

Arvicola (*Synaptomys*) *gossii*, Bd., Mus. S. I. (labels of Kansas specimens which, however, are inseparable from the types).

Hab. Middle and Western United States and northward. Brookville, Indiana, *Haymond*. South Illinois, *Kennicott*. Benton Co., Minnesota, *Garrison*. Neosho Falls, Kansas, *Goss*. Skagit Valley, Oregon, *Kennerly*. Nulato, Alaska, *Dall*.

Dimensions (average of several, alcoholic, from Kansas). Nose to eye 0.45; to ear 0.95; to occiput 1.20; to root of tail 3.50 (from 3.00 to 4.00—range of the whole series 2.90 to 4.30); tail vertebrae 0.65 (from 0.51 to 0.75); tail, with hairs, 0.75; fore foot 0.40; hind foot 0.70; ear 0.35.

Eighteen specimens, dry and alcoholic, examined from the above localities.

Genus VIII. **MYODES**, Pall., emend.

SYN. *Mus*, sp., et *Arvicola*, sp., Auctt. antiq.—*Hypudæus*, Illiger, 1811, *partim* (includes *Mus lemmus*, *amphibius*, etc.).—*Myodes*, Pall., Zoog. R. A. i. 1811, 172, in part (includes *Arvicola*, and thus about coextensive with his *Mures cunicularii* of 1778).—*Lemmus*, Linck (fide Bd. In part; includes *Arvicola*).—*Georychus*, Rich., F. B. A. 1829; and Aud. and Bach., 1854 (includes *Cuniculus*). Not of Illiger, which is of an entirely different family.

Obs. The chars. of this genus should unquestionably be so drawn as to exclude *Cuniculus*, which latter, although also a “lemming,” is quite as widely separated as the other genera of *Arvicolinæ* are. Being based upon a long and well-known animal, the

characters need not be here recapitulated. The several ascribed species of North American *Myodes* proper are reducible to the following, which is not specifically separable from that of Asia.

1. *Myodes obensis*, Brantz.

SYN. *Myodes obensis*, Brantz, Muisen, 1827, 55.—Keys. and Blas., Verb. Eur. vi. 1840, pp. vii. and 32. Midd., Sib. Reise, ii. 1853, 99, pl. ii. figs. 7, 8, 9, pl. viii. pl. ix. and pl. x. f. 2.—Baird, M. N. A., 1857, 559.

Arvicola (*Georychus*) *helvolus*, Rich., F. B. A., 1829, 128.

Georychus helvolus, Aud. & Bach., Q. N. A. iii. 1853, 84, pl. exx. f. 1.

Myodes helvolus, Dall, Alaska and its Res. 1870, 577.

Arvicola (*Georychus*) *trimucronatus*, Rich., App. Parry's 2d Voyage, 1825, 309; F. B. A. i. 1829, 130.

Georychus trimucronatus, Aud. and Bach., Q. N. A. iii. 1853, 86, pl. exx. f. 2, 3.

Myodes trimucronatus, Dall, Alaska, 1870, 577.

Myodes albogularis, Wagner, Suppl. Schreber, iii. 1843, 602.

Hab. More western portions of Arctic America.

Obs. Of this species I have handled about forty specimens, the first examined by an American naturalist for many years. They differ somewhat from the only two Siberian skins before me, possibly representing a variety (to be called *Myodes helvolus*); but I am far from disputing Von Middendorff's decision as to their specific identity with the Asiatic animal.

Genus IX. **CUNICULUS**, Wagler.

SYN. *Mus*, *Arvicola*, *Myodes et Lemmus*, Auctt.—*Georychus*, *partim*, Rich., Aud. and Bach., *nec Il.*—*Cuniculus*, Wagler ("1830"), Isis, 1832, 1220; type *C. grænlandicus* = *C. torquatus* or *hudsonius*.—Lilljeborg, Syst. Ofvers. Gnag. Glires, 1866 (same type).

Obs. Without going into the characters of a perfectly well-known form, I wish to particularly signalize the fact that this genus, though based upon a "lemming," is very different from *Myodes*, and, indeed, from any other arvicoline type. The molar pattern is strongly of an ordinary arvicoline general character—not at all as in *Myodes* or *Synaptomys*—while details of the molar dentition (as, for instance, six prisms on back upper molar and nine on front lower molar) are unique. The obsolete ear and pollex, the singular hypertrophy of the two middle fore claws, and the notable seasonal changes of pelage, are all peculiar. I find but one American species, identical with that of Asia. A second supposed species, *C. lagurus*, I have not seen.

1. *Cuniculus hudsonius*, (Forst.) Coues.

- SYN. *Mus hudsonius*, Forst., Phil. Trans. lxii. 1772, 379.—Pall., N. Sp. Glir. 1778, 201.—Gm., Syst. Nat. i. 1788, 137.
Lemmus hudsonius, Sab., Suppl. Parry's Voy. 1824, 185; App. Franklin's Journ. 1825, 661.—Harl., Fn. Amer. 546.
Arvicola hudsonia, Rich., App. Parry's 2d Voy., 308.
Arvicola (Georychus) hudsonius, Rich., F. B. A. i. 1829, 132.
Myodes hudsonius, Wagn., Suppl. Schreb. iii. 1843, 604.—Midd., Bull. Acad. St. Petersb. iii. xix. Dall, Alaska, 577.
Georychus hudsonius, Aud. and Bach., Q. N. A. iii. 1853, 81, pl. cxix.
Mus torquatus, Pall., N. Sp. Glir. 1778, pp. 77 and 205, pl. xi. B.
Myodes torquatus, Keys. and Blas. Wirb. Eur. 1840, pp. vi. and 32.—Midd., Sib. Reise, ii. 1853, 87, pl. iv.-vii. and x.—Baird, M. N. A., 1857, 558.
Mus lenensis, Pall., N. Sp. Glir. 1778, 195.
Mus grænlandicus, Traill, Scoresby's Greenland, 1823, 416.
Arvicola (Georychus) grænlandicus, Rich., F. B. A. i. 1829, 134.
Georychus grænlandicus, Aud. and Bach., Q. N. A. iii. 1854, 315.
Cuniculus grænlandicus, Wagler, Isis, 1832, 1220.
Myodes grænlandicus, Wagner, Suppl. Schreber, 1843, 606.
Lemmus ungulatus, Baer, Baer and Helm., Beit. iv. 1841, 283.
Hudson's Rat and Hare-tailed Rat, Penn., Arct. Zool. i. 132, 133; Quad. ii. 201.—*Hare-tailed Mouse*, Hearne, Journ. 387.—*Hudson's Bay Lemming*, Aliq.—*Wapiskoosesick* ("White Bear Mouse") of the Crees, *Lunaguy* ("White Mouse") of the Chippeways, *Awing-naek* ("White Mouse") of the Esquimaux.

Hab. Arctic regions.

Genus X. **FIBER**, Cuvier.

- SYN. *Castor*, L., S. N. i. 1766, 78 (not type).—*Mus*, Gm., S. N. i. 1788 (not type).—"Myocastor, Kerr's Linn., 1792," partly, (type *Myopotamus coypus*).—*Fiber*, Cuv., Leçons, i. 1800 (type *Castor zibethicus*, L.).—*Lemmus*, Fisher, Syn. 1829 (partly).—*Ondatra*, Waterh., Charlesw. Mag. iii. 1839 (type *zibethicus*).

Obs. Although this well-known form presents many peculiarities, these are chiefly in adaptation to aquatic habits; it is strictly arvicoline in all essentials.

1. *Fiber zibethicus*, (L.) Cuv.

- SYN. *Castor zibethicus*, Linn., S. N. i. 1766, 79.
Mus zibethicus, Gm., S. N. i. 1788, 125.
Myocastor zibethicus, "Kerr's Linn. 1792."
Fiber zibethicus, Cuv., R. A. i. 1817, 172, and of authors.
Lemmus zibethicus, Fisch., Syn. 1829, 289.
Ondatra zibethicus, Waterh., Charlesw. Mag. iii. 1839, 594.

? *Fiber osoyensis*, Lord, P. Z. S. 1863, 95 (British Columbia).

Hab. North America.

